Doc Id = US 20050080654

MRO Integrated Supply Chain Management Overview

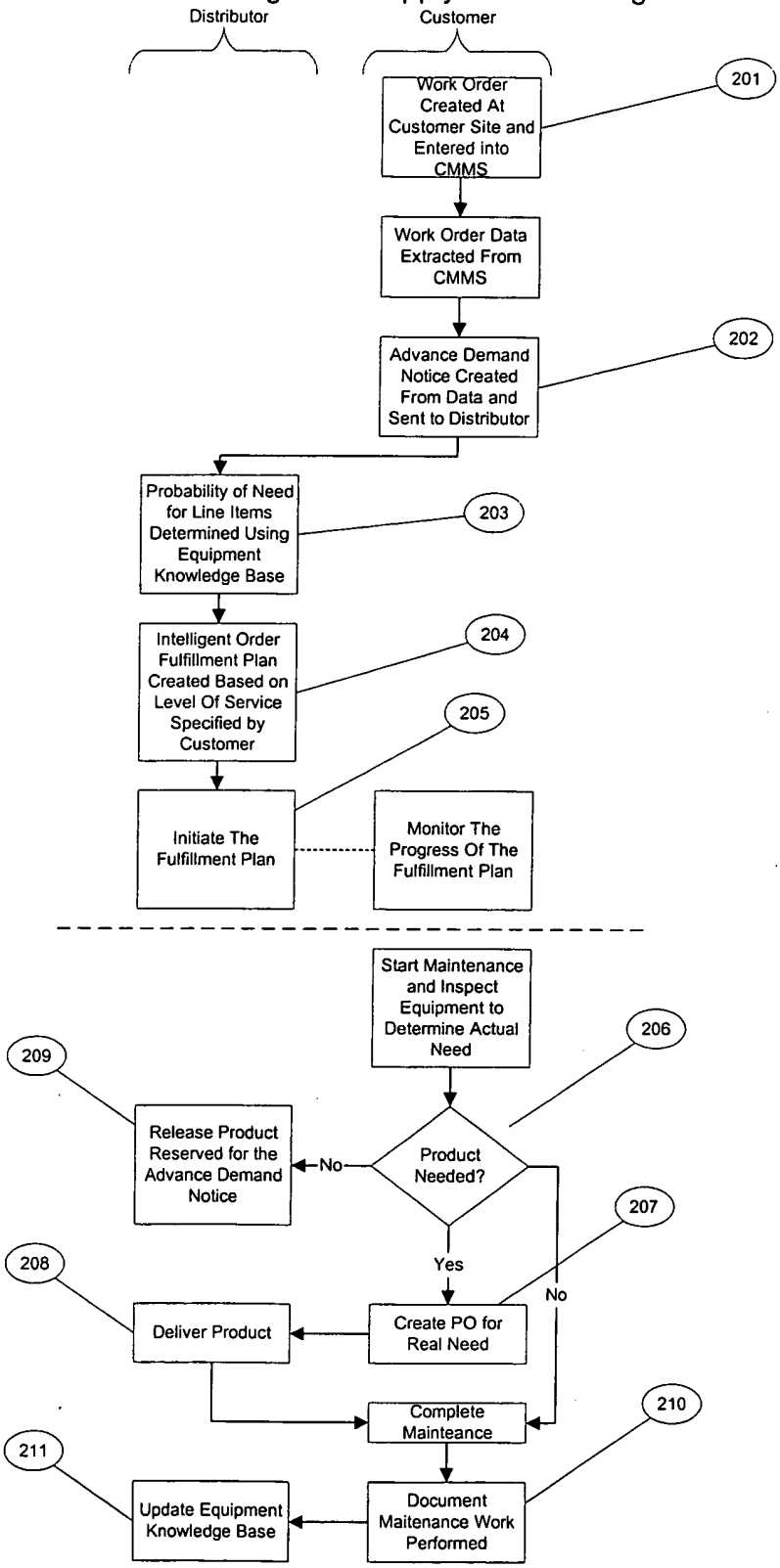

Figure 1

Intelligent Agent and Transaction Network

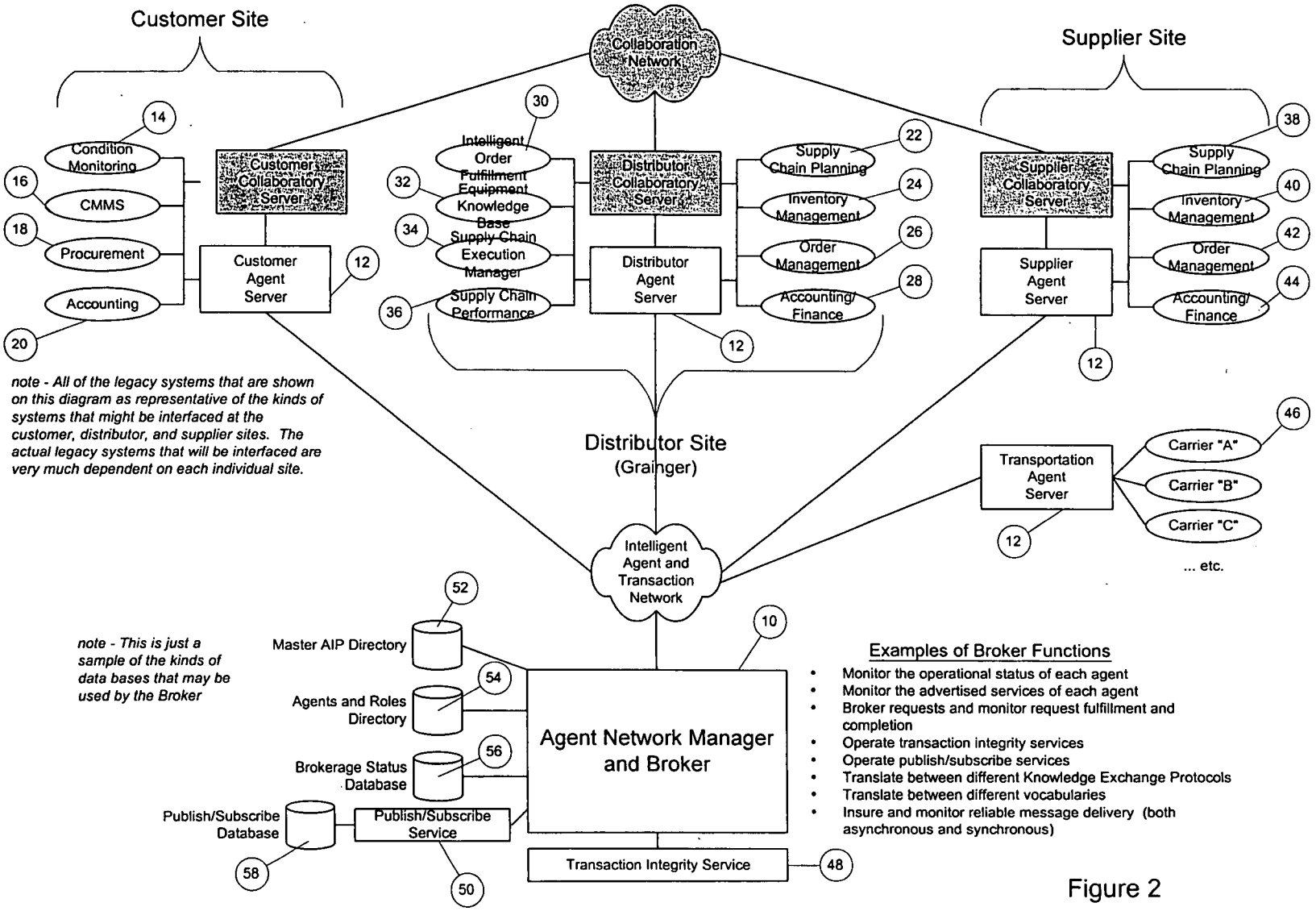

Figure 2

Agent Server Components

Depicted in the Context of a Customer Site

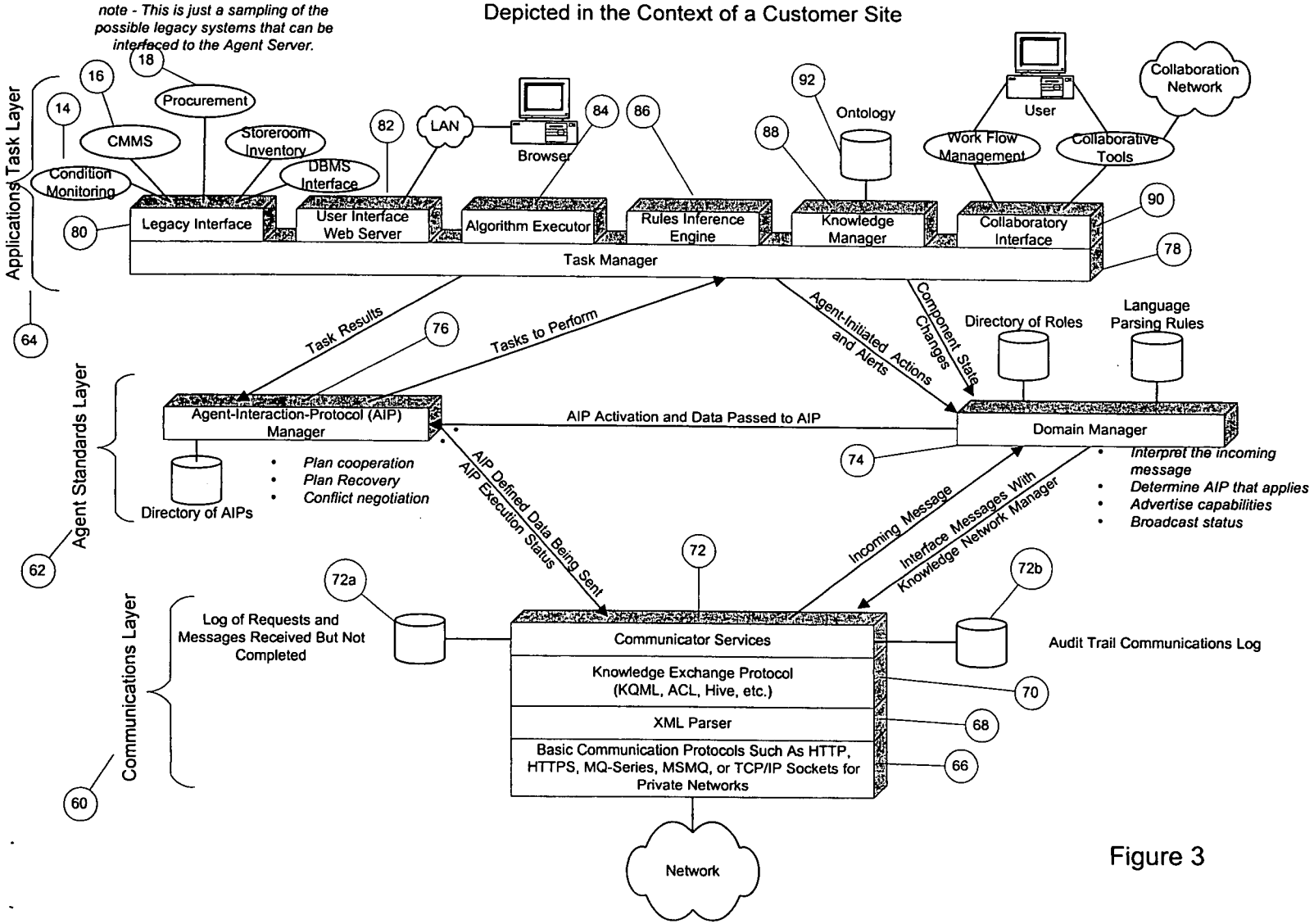

Figure 3

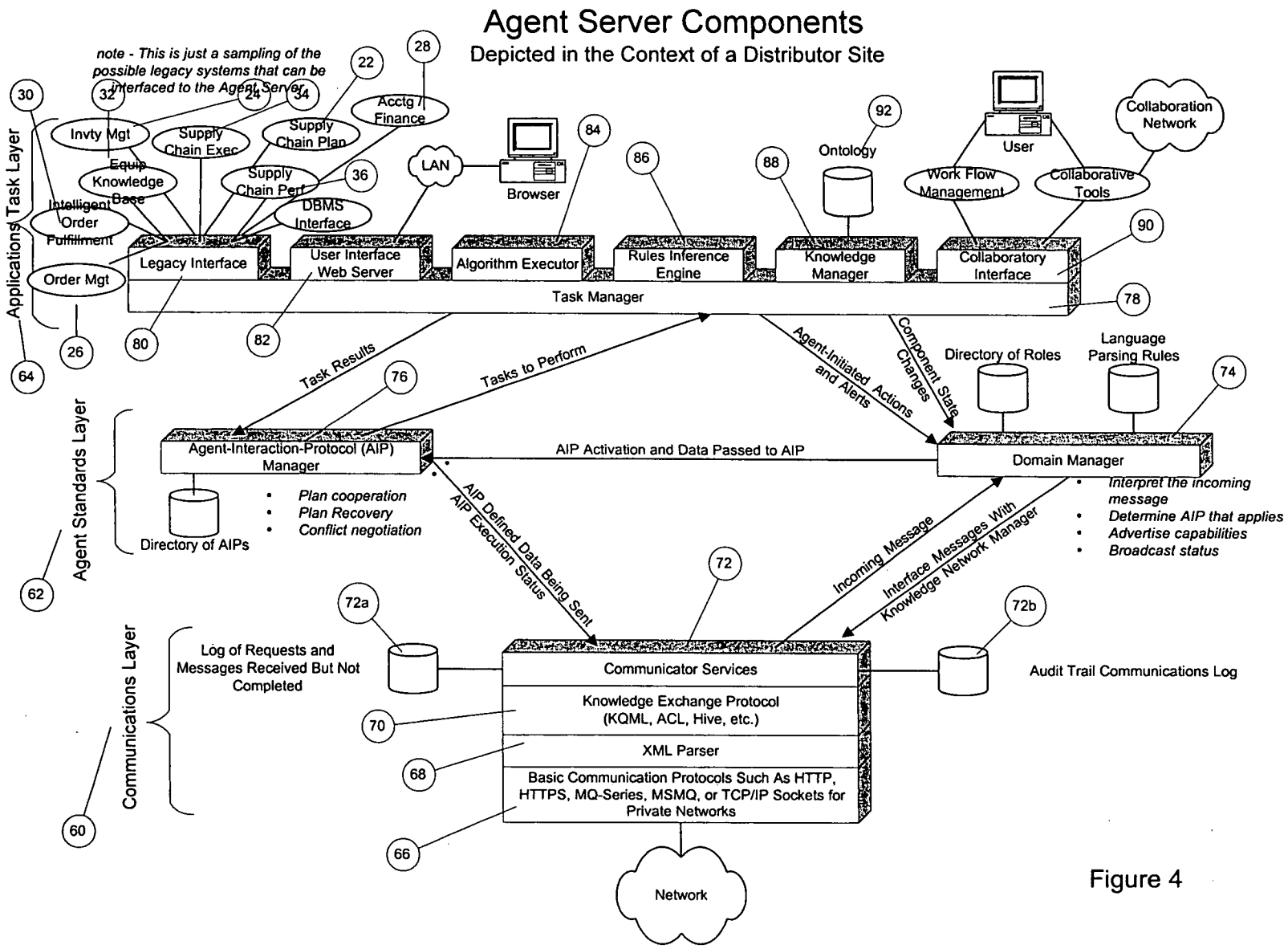
Agent Server Components
Depicted in the Context of a Distributor Site
note - This is just a sampling of the possible legacy systems that can be interfaced to the Agent Server
Applications Task Layer
Invty Mgt
Supply Chain Exec
Supply Chain Plan
Acctg / Finance
Equip Knowledge Base
Supply Chain Perf
DBMS Interface
Intelligent Order Fulfillment
Order Mgt
LAN
Browser
Ontology
User
Collaboration Network
Work Flow Management
Collaborative Tools
Legacy Interface
User Interface Web Server
Algorithm Executor
Rules Inference Engine
Knowledge Manager
Collaboratory Interface
Task Manager
Task Results
Tasks to Perform
Agent-Initiated Actions and Alerts
Component State Changes
Directory of Roles
Language Parsing Rules
Agent Standards Layer
Agent-Interaction-Protocol (AIP) Manager
AIP Activation and Data Passed to AIP
Domain Manager
Directory of AIPs
Plan cooperation
Plan Recovery
Conflict negotiation
Interpret the incoming message
Determine AIP that applies
Advertise capabilities
Broadcast status
AIP Defined Data Being Sent
AIP Execution Status
Incoming Message
Interface Messages With Knowledge Network Manager
Communications Layer
Log of Requests and Messages Received But Not Completed
Communicator Services
Knowledge Exchange Protocol (KQML, ACL, Hive, etc.)
XML Parser
Basic Communication Protocols Such As HTTP, HTTPS, MQ-Series, MSMQ, or TCP/IP Sockets for Private Networks
Audit Trail Communications Log
Network

Figure 4

Agent Server Components

Depicted in the Context of a Supplier Site

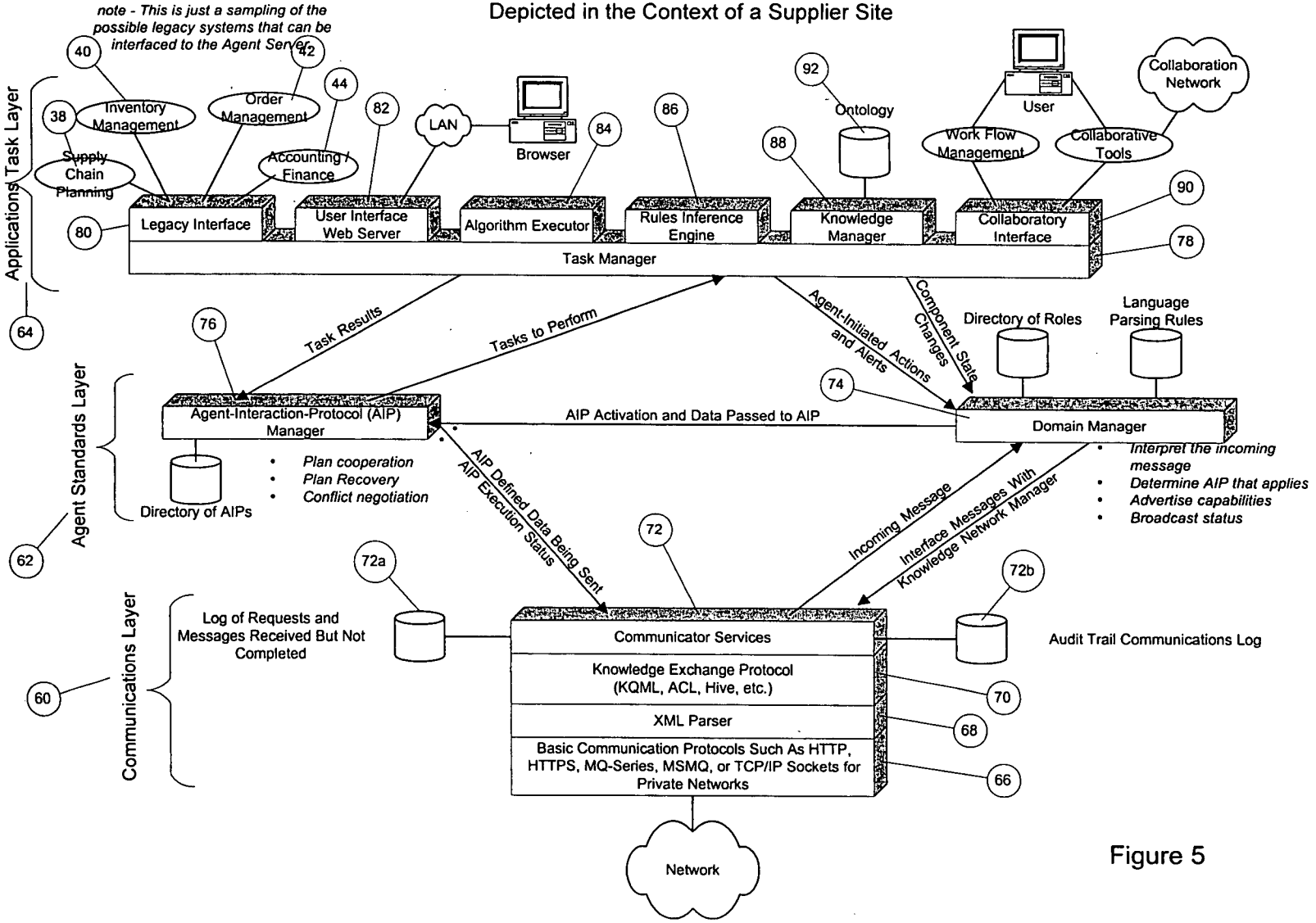

Figure 5

Ontology Structure and Meta-Knowledge

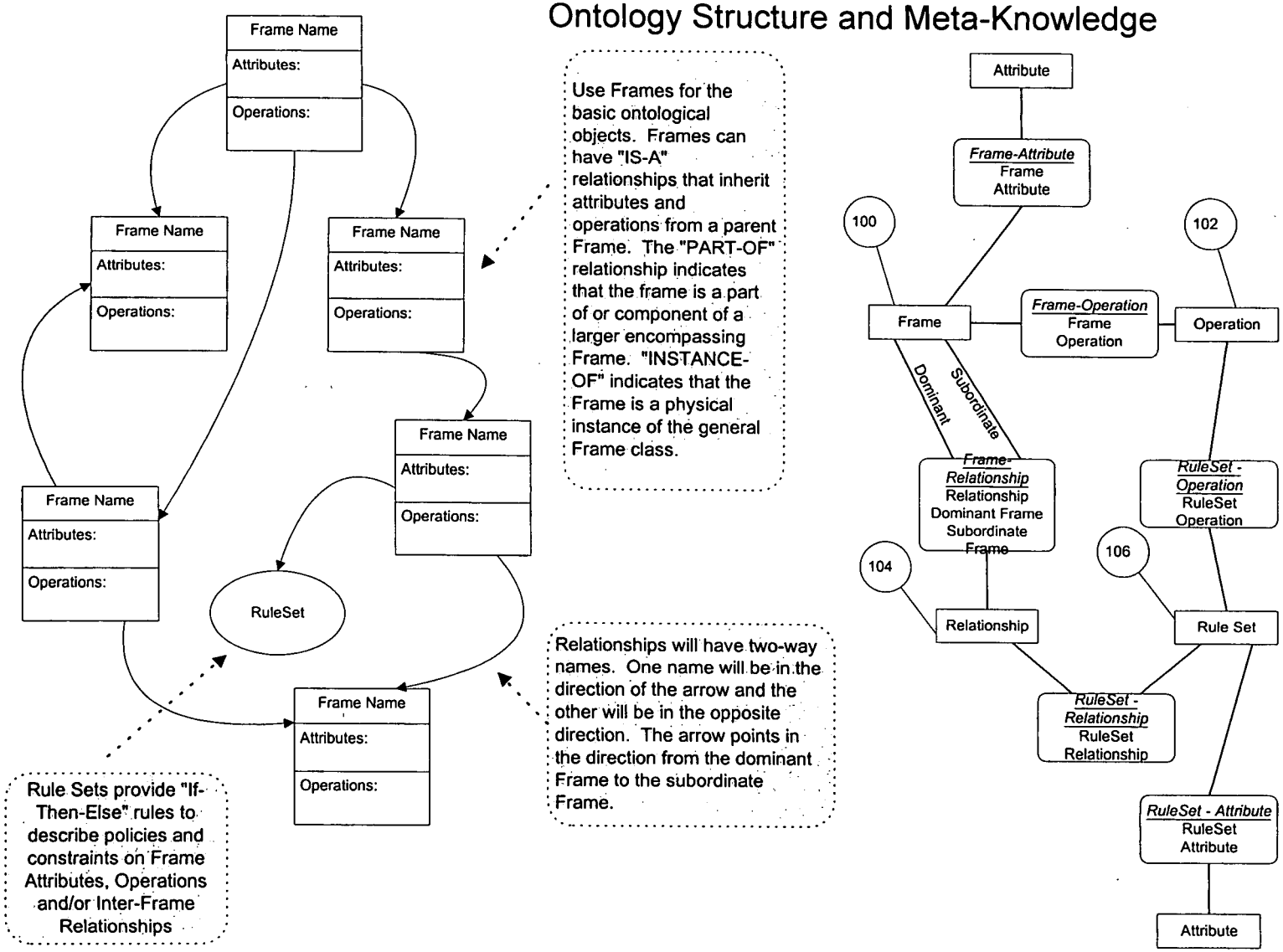

Figure 6

Intelligent Order Fufillment Planning

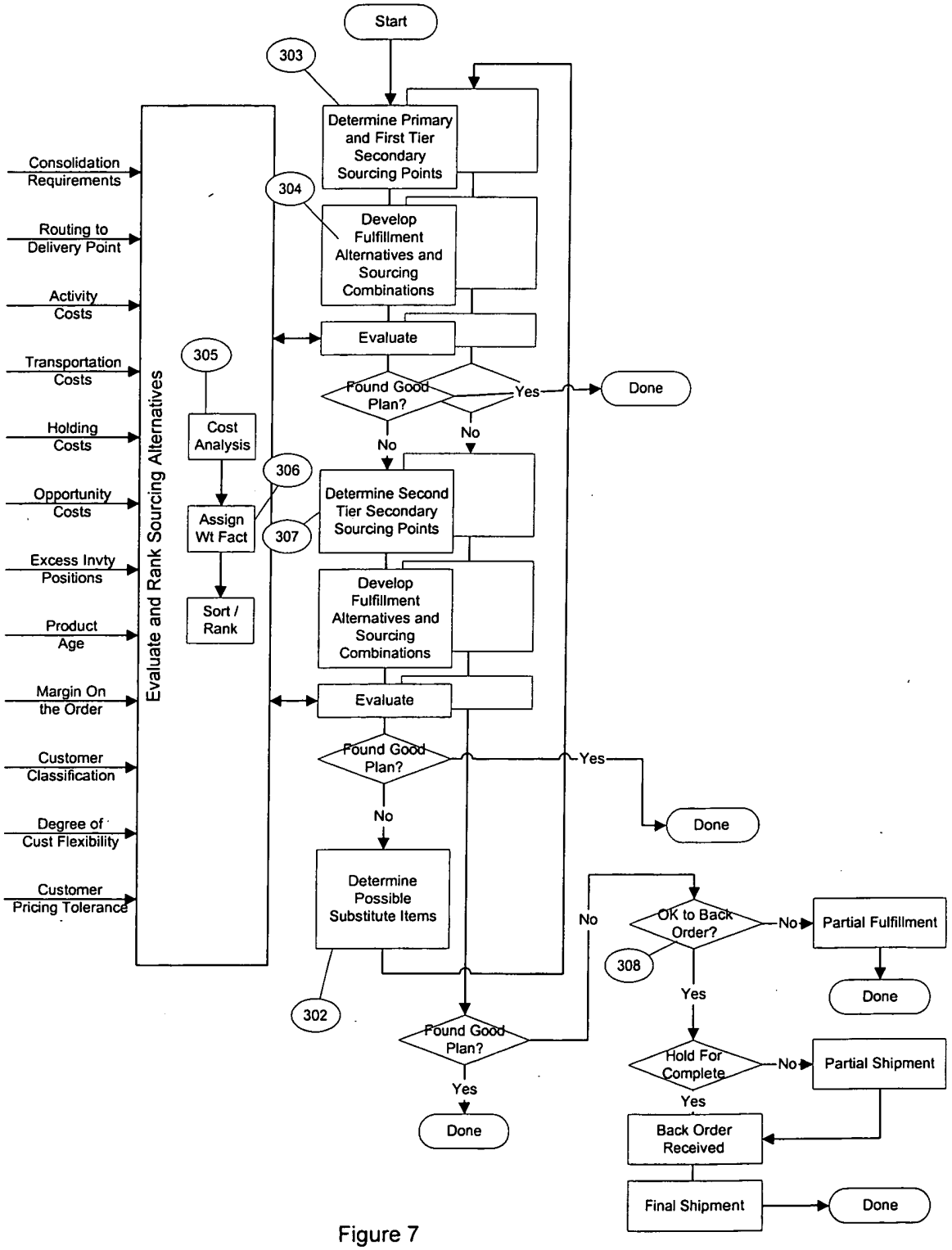

Figure 7

Inventory Management

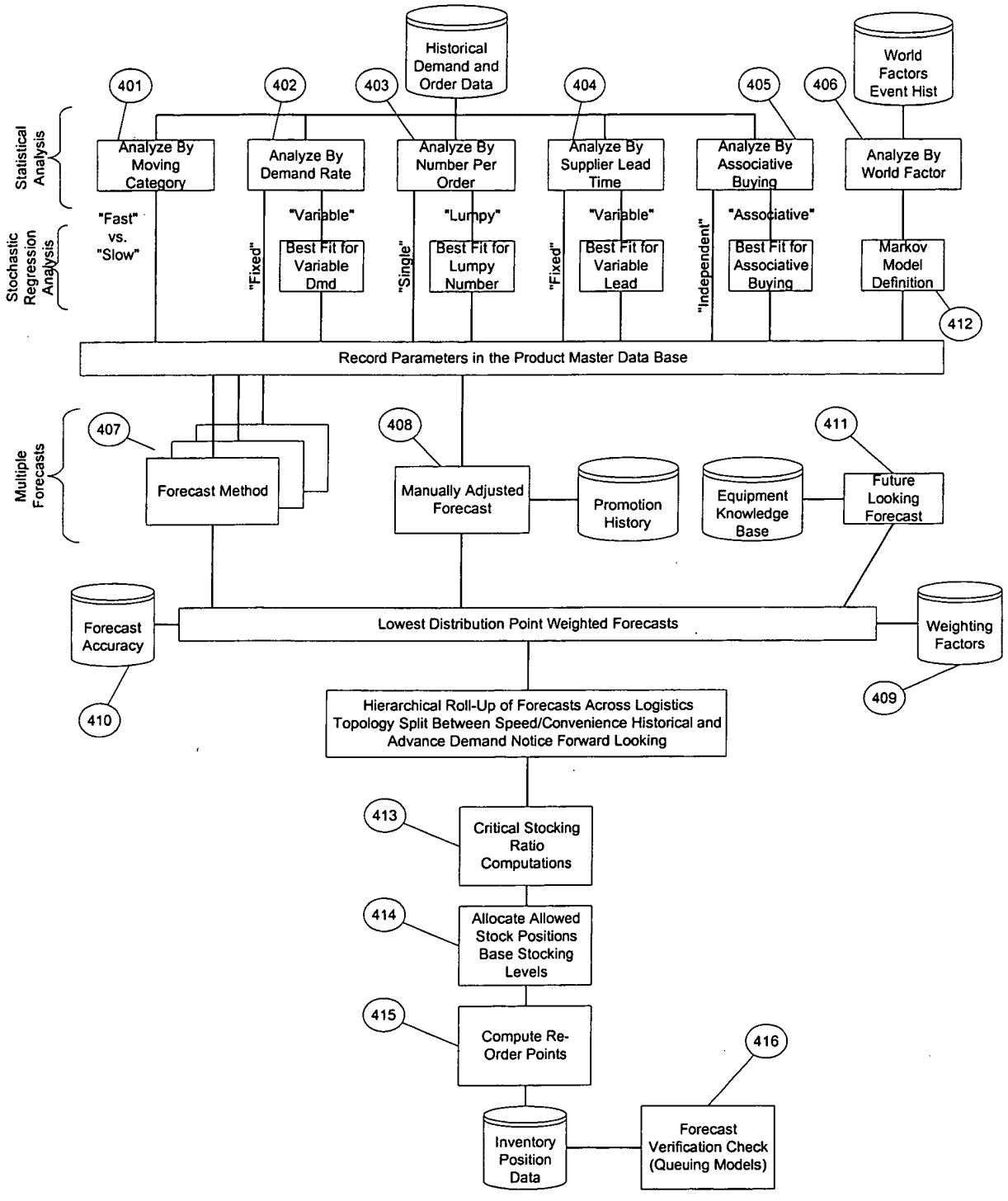

Figure 8

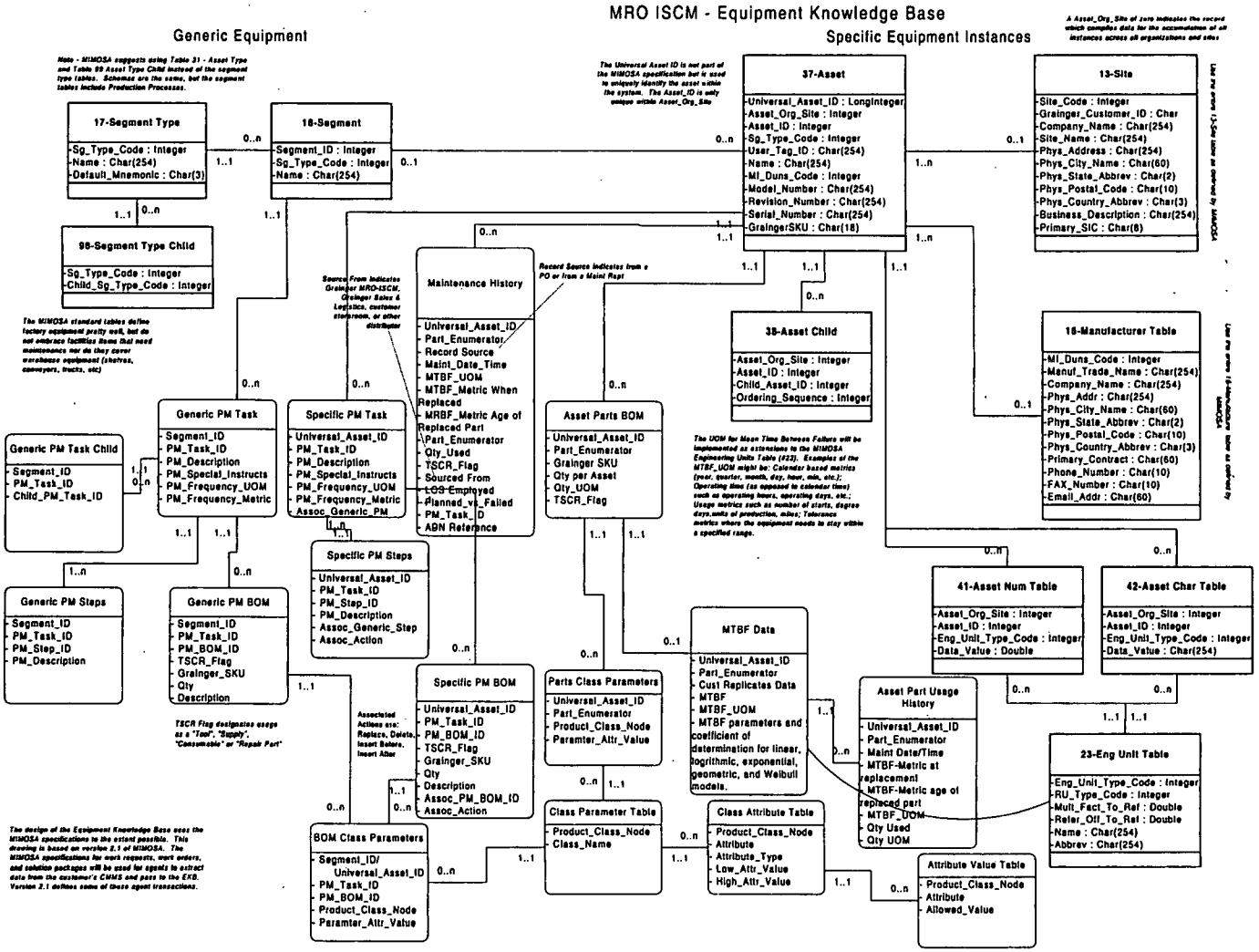
MRO ISCM - Equipment Knowledge Base
Generic Equipment
Specific Equipment Instances
17-Segment Type
-Sg_Type_Code : Integer
-Name : Char(254)
-Default_Mnemonic : Char(3)
18-Segment
-Segment_ID : Integer
-Sg_Type_Code : Integer
-Name : Char(254)
98-Segment Type Child
-Sg_Type_Code : Integer
-Child_Sg_Type_Code : Integer
37-Asset
-Universal_Asset_ID : LongInteger
-Asset_Org_Site : Integer
-Asset_ID : Integer
-Sg_Type_Code : Integer
-User_Tag_ID : Char(254)
-Name : Char(254)
-MI_Duns_Code : Integer
-Model_Number : Char(254)
-Revision_Number : Char(254)
-Serial_Number : Char(254)
-GraingerSKU : Char(18)
13-Site
-Site_Code : Integer
-Grainger_Customer_ID : Char
-Company_Name : Char(254)
-Site_Name : Char(254)
-Phys_Address : Char(254)
-Phys_City_Name : Char(60)
-Phys_State_Abbrev : Char(2)
-Phys_Postal_Code : Char(10)
-Phys_Country_Abbrev : Char(3)
-Business_Description : Char(254)
-Primary_SIC : Char(8)
Maintenance History
- Universal_Asset_ID
- Part_Enumerator
- Record Source
- Maint_Date_Time
- MTBF_UOM
- MTBF_Metric When Replaced
- MRBF_Metric Age of Replaced Part
- Part_Enumerator
- Qty_Used
- TSCR_Flag
- Sourced From
- LOS Employed
- Planned_vs_Failed
- PM_Task_ID
- ABN Reference
38-Asset Child
-Asset_Org_Site : Integer
-Asset_ID : Integer
-Child_Asset_ID : Integer
-Ordering_Sequence : Integer
18-Manufacturer Table
-MI_Duns_Code : Integer
-Manuf_Trade_Name : Char(254)
-Company_Name : Char(254)
-Phys_Addr : Char(254)
-Phys_City_Name : Char(60)
-Phys_State_Abbrev : Char(2)
-Phys_Postal_Code : Char(10)
-Phys_Country_Abbrev : Char(3)
-Primary_Contract : Char(60)
-Phone_Number : Char(10)
-FAX_Number : Char(10)
-Email_Addr : Char(60)
Generic PM Task
- Segment_ID
- PM_Task_ID
- PM_Description
- PM_Special_Instructs
- PM_Frequency_UOM
- PM_Frequency_Metric
Specific PM Task
- Universal_Asset_ID
- PM_Task_ID
- PM_Description
- PM_Special_Instructs
- PM_Frequency_UOM
- PM_Frequency_Metric
- Assoc_Generic_PM
Asset Parts BOM
- Universal_Asset_ID
- Part_Enumerator
- Grainger SKU
- Qty per Asset
- Qty_UOM
- TSCR_Flag
Generic PM Task Child
- Segment_ID
- PM_Task_ID
- Child_PM_Task_ID
Specific PM Steps
- Universal_Asset_ID
- PM_Task_ID
- PM_Step_ID
- PM_Description
- Assoc_Generic_Step
- Assoc_Action
Generic PM Steps
- Segment_ID
- PM_Task_ID
- PM_Step_ID
- PM_Description
Generic PM BOM
- Segment_ID
- PM_Task_ID
- PM_BOM_ID
- TSCR_Flag
- Grainger_SKU
- Qty
- Description
Specific PM BOM
- Universal_Asset_ID
- PM_Task_ID
- PM_BOM_ID
- TSCR_Flag
- Grainger_SKU
- Qty
- Description
- Assoc_PM_BOM_ID
- Assoc_Action
MTBF Data
- Universal_Asset_ID
- Part_Enumerator
- Cust Replicates Data
- MTBF
- MTBF_UOM
- MTBF parameters and coefficient of determination for linear, logarithmic, exponential, geometric, and Weibull models.
Parts Class Parameters
- Universal_Asset_ID
- Part_Enumerator
- Product_Class_Node
- Paramter_Attr_Value
41-Asset Num Table
-Asset_Org_Site : Integer
-Asset_ID : Integer
-Eng_Unit_Type_Code : Integer
-Data_Value : Double
42-Asset Char Table
-Asset_Org_Site : Integer
-Asset_ID : Integer
-Eng_Unit_Type_Code : Integer
-Data_Value : Char(254)
Asset Part Usage History
- Universal_Asset_ID
- Part_Enumerator
- Maint Date/Time
- MTBF-Metric at replacement
- MTBF-Metric age of replaced part
- MTBF_UOM
- Qty Used
- Qty UOM
23-Eng Unit Table
-Eng_Unit_Type_Code : Integer
-RU_Type_Code : Integer
-Mult_Fact_To_Ref : Double
-Refer_Off_To_Ref : Double
-Name : Char(254)
-Abbrev : Char(254)
BOM Class Parameters
- Segment_ID/ Universal_Asset_ID
- PM_Task_ID
- PM_BOM_ID
- Product_Class_Node
- Paramter_Attr_Value
Class Parameter Table
- Product_Class_Node
- Class_Name
Class Attribute Table
- Product_Class_Node
- Attribute
- Attribute_Type
- Low_Attr_Value
- High_Attr_Value
Attribute Value Table
- Product_Class_Node
- Attribute
- Allowed_Value
Note - MIMOSA suggests using Table 31 - Asset Type and Table 99 Asset Type Child instead of the segment type tables. Schemas are the same, but the segment tables include Production Processes.
The MIMOSA standard tables define factory equipment pretty well, but do not embrace facilities items that need maintenance nor do they cover warehouse equipment (shelves, conveyors, trucks, etc)
Source From Indicates Grainger MRO-ISCM, Grainger Sales & Logistics, customer storeroom, or other distributor
Record Source Indicates from a PO or from a Maint Rept
The Universal Asset ID is not part of the MIMOSA specification but is used to uniquely identify the asset within the system. The Asset_ID is only unique within Asset_Org_Site
A Asset_Org_Site of zero indicates the record which compiles data for the accumulation of all instances across all organizations and sites
The UOM for Mean Time Between Failure will be implemented as extensions to the MIMOSA Engineering Units Table (#23). Examples of the MTBF_UOM might be: Calendar based metrics (year, quarter, month, day, hour, min, etc.); Operating time (as opposed to calendar time) such as operating hours, operating days, etc.; Usage metrics such as number of starts, degree days,units of production, miles; Tolerance metrics where the equipment needs to stay within a specified range.
TSCR Flag designates usage as a "Tool", "Supply", "Consumable" or "Repair Part"
Associated Actions are: Replace, Delete, Insert Before, Insert After
The design of the Equipment Knowledge Base uses the MIMOSA specifications to the extent possible. This drawing is based on version 2.1 of MIMOSA. The MIMOSA specifications for work requests, work orders, and solution packages will be used for agents to extract data from the customer's CMMS and pass to the EKB. Version 2.1 defines some of these agent transactions.
0..n
1..1
1..n
0..1

Figure 9

New Customer Equipment Data Added to Equipment Knowledge Base

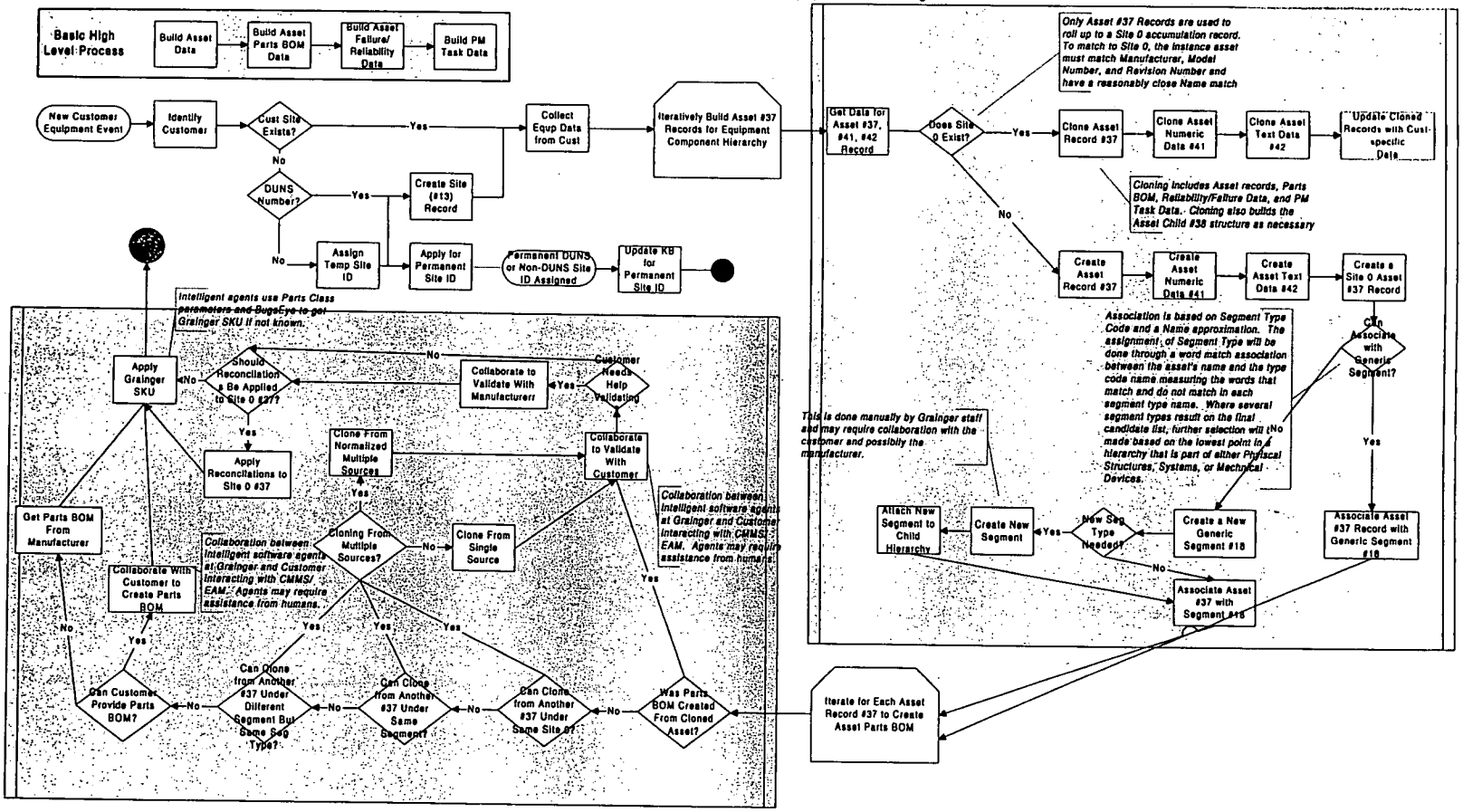

Figure 10a

New Customer Equipment Data Added to Equipment Knowledge Base (cont)

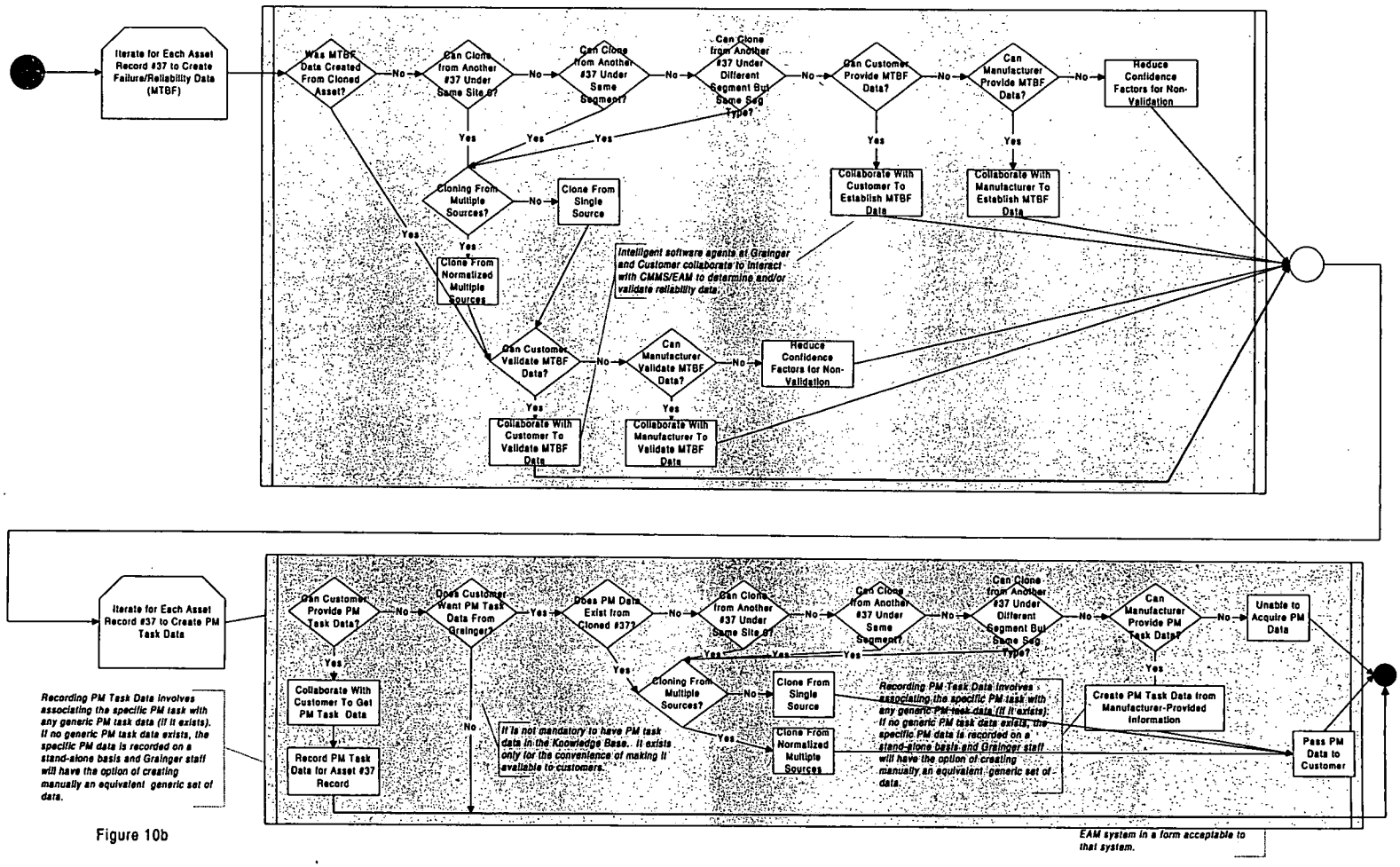

Figure 10b

Record Maintenance Results in the Equipment Knowledge Base

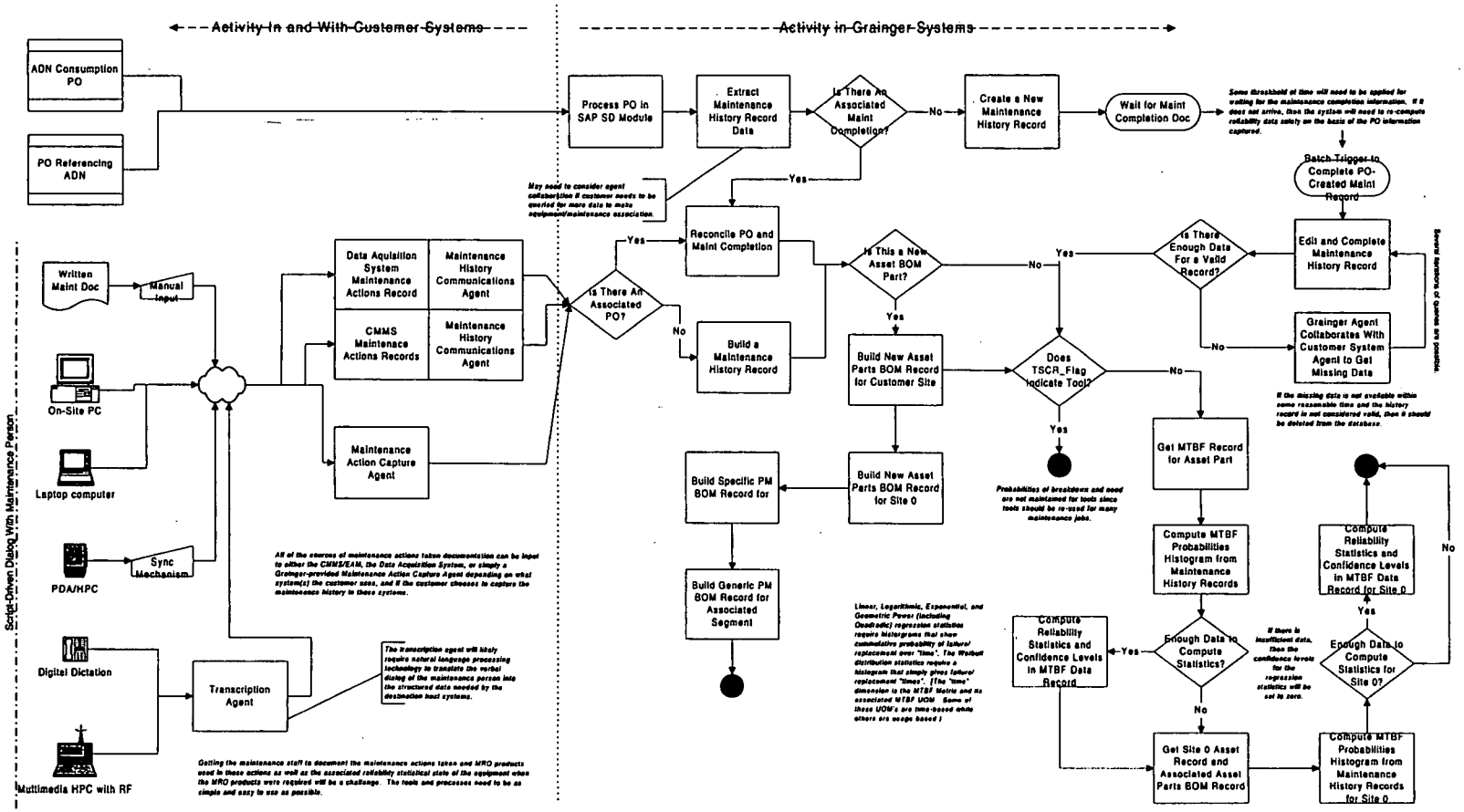

Figure 11

MRO Integrated Supply Chain Management Environment and System

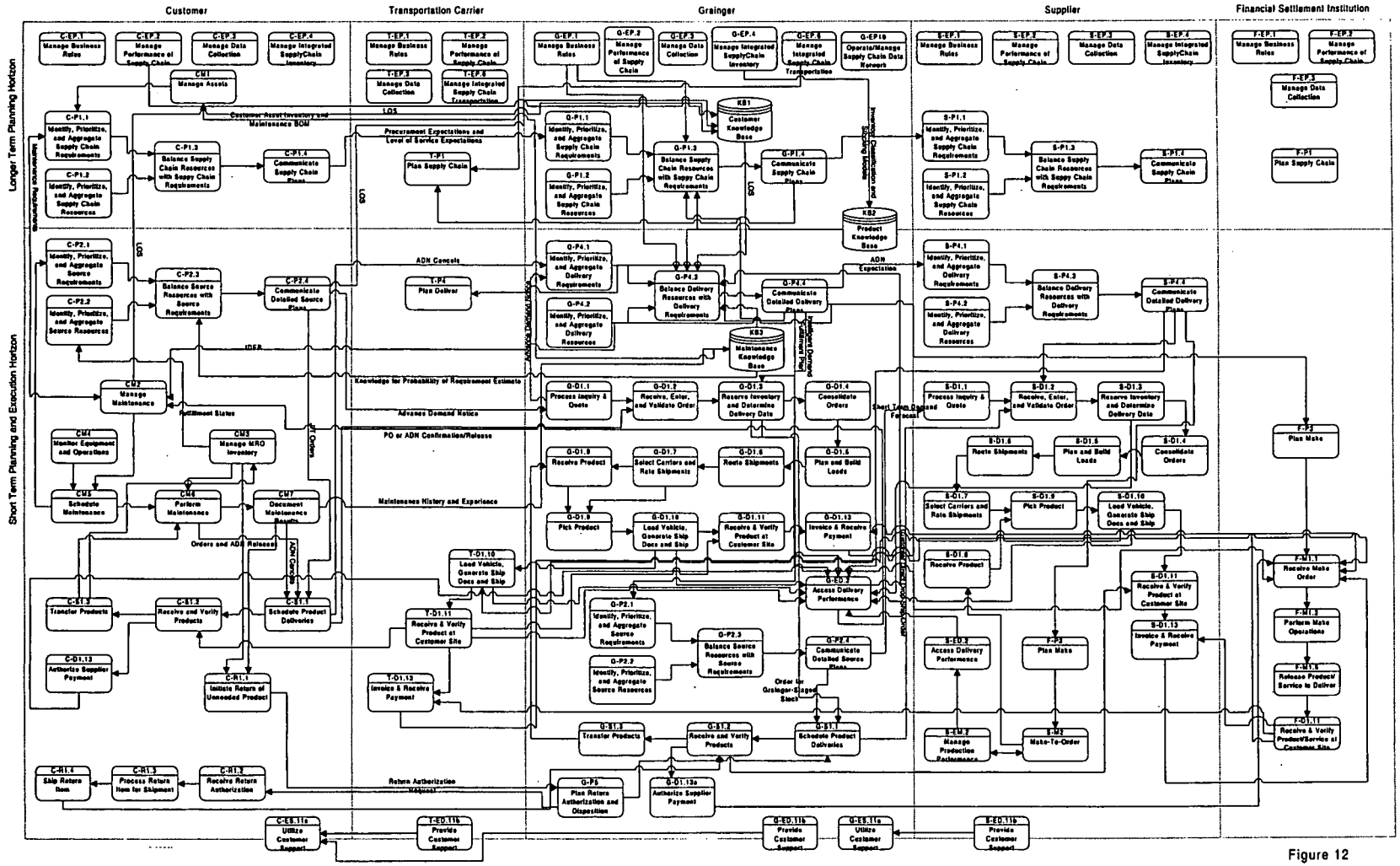

Figure 12

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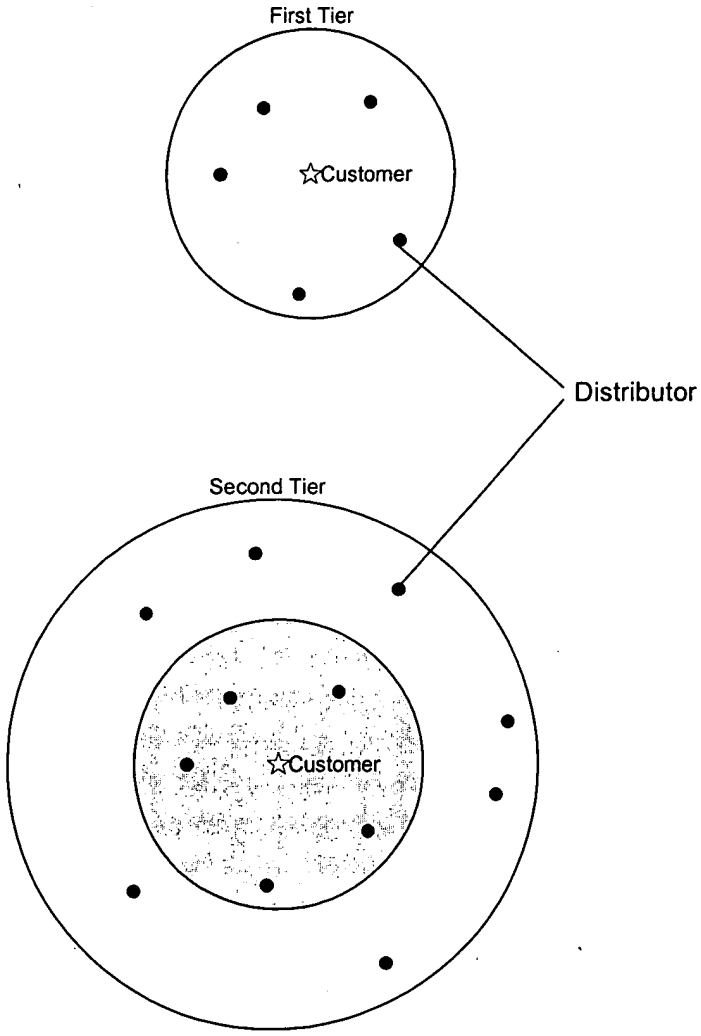

FIGURE 13